TOMATO RESEARCH PROGRESS REPORT

For the 2004 season

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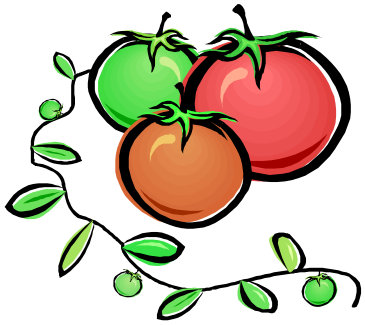

CONTENTS

UCCE Processing Tomato Variety Trial 2004, Merced

UCCE Merced and Madera Counties

Location: NW corner of Henry Miller and Delta Rds, near Los Banos. Dan Burns, San Juan Ranch cooperator.

Mid maturity Varieties:

REPLICATED				OBSERVATIONAL			
plot	company	variety	resistance	plot	company	variety	resistance
1	CTRI/CPL	CPL 4863-N	VFFN	19	Campbell's	CXD 236	VFFN
2	Heinz	H2401	VFFNP	20	Harris Moran	HMX 3859	VFFNP
3		H2501	VFFNP	21		HMX 3863	VFFNP
4		H2601	VFFNP	22	Nippon Del M	NDM 0098	VFFN
5		H5503	VFFNP	23	Orsetti	BOS 47721	VFFN
6		H5803	VFFNP	24		BOS 52295	VFFNP
7		H8892	VFFN	25		BOS 7025	VFFNP
8		H9665	VFFNP	26	Seminis	PX 345	VFFNP
9	Orsetti	Halley 3155	VFF	27	Sunseeds	SUN 6365	VFFNP
10	Rogers	LaRossa	VFF	28		SUN 6366	VFFNP
11	Seminis	PS296	VFFNP	29	Unilever	U 232	VFFNP
12		PS607	VFFN	30		U258	VFFNP
13	Sunseeds	SUN 6119	VFFN				
14		SUN 6360	VFFNP				
15		RED SKY	VFFP				
16	Unilever	U 005 EFS	VFFNP				
17		U941	VFFN				
18	United Genetics	UG 151	VFFN				

Plot layout:

18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	28	29	30
4	13	1	18	16	10	2	7	12	3	6	11	9	15	17	8	14	5	25	26	27
12	15	6	16	2	7	13	11	14	1	8	4	10	17	5	3	18	9	22	23	24
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21

REPLICATED OBS

Methods:

Seeded: March 8 and 9, 2004. LaBar's greenhouse.
Transplanted: May 8, 2004. 100 ft plots.
Field day Aug 19. Sampled Aug 31.
Harvest: September 13, 2004. Hand harvest 10 ft from each plot.

Results:

Yield and fruit quality results for the replicated and observation varieties are shown in Tables 1 and 2, respectively. This field did not have to be commercially harvested because the grower had already met his contract obligations prior to field maturity. As a result, the plots were hand harvested by cutting plants from 10 feet of each plot (Fig 1). The field was actually over-mature by the time we harvested, and color separation was unnecessary. Rather, many plots were going down to powdery mildew and phytophthora, and yield loss occurred to dehydration and rot. These problems coupled with the inherit greater variability with a hand harvest resulted in a higher than normal coefficient of variation for yield.

Fruit samples were taken 2 weeks prior to harvest before any significant deterioration of the plots had occurred.

Even with a delayed harvest, yields were excellent in this field, with almost every variety > 40 tons/A. Heinz dominated in yields with this trial, capturing five of the top 6 slots. H9665, H5803 EFS, H2601, and H2401 averaged more than 2.5 tons/A soluble solids, however, there was no significant separation in Brix yield for the top 13 varieties.

In the observational trial, best yield occurred with Seminis PX 345 with an outstanding 74 tons/A. This yield reflects a spot in the plot with a strong healthy canopy and may not be indicative of the whole plot, however. U 232, HMX 3859, and HMX 3863 also both yielded more than 50 tons/A with brix yields > 2.5 tons/A.

Overall state results are shown in Table 3. Participating counties included Yolo, Colusa, Stanislaus, Fresno, Kern, and Merced.

Acknowledgements: Many thanks to Dan Burns with San Juan Ranch for his help and cooperation with this trial, CTRI for financial assistance, and participating seed companies.

Table 1. Processing tomato variety trial yield results, Merced 2004.

REPLICATED			Disease	Yield							SS	PTAB		SS Yield
Plot	Company	Variety	Resistance	Tons/A							%	Color	pH	Tons/A
8	Heinz	H9665	VFFNP	56.388	a						4.6	24	4.36	2.577
2	Heinz	H2401	VFFNP	54.461	a	b					4.6	24	4.28	2.521
4	Heinz	H2601	VFFNP	52.141	a	b	c				4.9	25	4.42	2.522
3	Heinz	H2501	VFFNP	50.029	a	b	c	d			5.0	23	4.40	2.477
6	Heinz	H5803	VFFNP	49.985	a	b	c	d			5.1	23	4.44	2.526
17	Unilever	U941	VFFN	49.495	a	b	c	d	e		4.8	25	4.44	2.377
13	Sunseeds	SUN 6119	VFFN	48.177		b	c	d	e		5.1	28	4.42	2.438
7	Heinz	H8892	VFFN	48.096		b	c	d	e		4.5	24	4.42	2.169
1	CTRI/CPL	CPL 4863-N	VFFN	47.388		b	c	d	e		4.5	24	4.42	2.109
16	Unilever	U 005 EFS	VFFNP	46.468		b	c	d	e	f	4.9	26	4.34	2.269
14	Sunseeds	SUN 6360	VFFNP	45.890			c	d	e	f	4.8	23	4.45	2.214
18	United Genetics	UG 151	VFFN	45.814			c	d	e	f	4.8	24	4.45	2.181
5	Heinz	H5503	VFFNP	43.957			c	d	e	f	4.7	23	4.44	2.051
15	Sunseeds	RED SKY	VFFP	43.418				d	e	f	4.9	23	4.49	2.099
11	Seminis	PS296	VFFNP	42.384				d	e	f	5.4	26	4.37	2.300
9	Orsetti	Halley 3155	VFF	41.377					e	f g	5.3	25	4.40	2.187
12	Seminis	PS607	VFFN	38.311						f g	5.3	25	4.45	2.007
10	Rogers	LaRossa	VFF	33.835						g	4.8	25	4.45	1.597
		Average		46.534							4.9	24.5	4.41	2.266
		LSD 0.05		8.197							0.4	1.8	0.09	0.49
		CV, %		12.4							5	4.5	1.2	13.2

Yield results estimated from hand harvest of 10 ft.
SS = soluble solids
Color = lower values indicate redder fruit.
SS yield = soluble solids yield, in tons/A
Disease resistance: V = Verticillium, FF = Fusarium race 1 and 2, N = nematodes, P = bacterial speck.

LSD 0.05 = Least Significant Difference at the 95% probabilty level. Means within each column separated by less than this amount are not significantly different.
For yield, LSD is designated by a letter.
CV, % = coefficient of variation, a measure of the variablility in the experiment.

Table 2. Observational varieties. Merced County 2004.

OBSERVATION Plot	Company	Variety	Disease Resistance	Yield Tons/A	SS %	PTAB Color	pH	SS Yield Tons/A
26	Seminis	PX 345	VFFNP	73.965	4.6	27	4.42	3.402
29	Unilever	U 232	VFFNP	58.153	4.6	26	4.52	2.675
21	Harris Moran	HMX 3863	VFFNP	54.276	4.6	26	4.56	2.497
30	Unilever	U258	VFFNP	48.787	4.6	24	4.53	2.244
27	Sunseeds	SUN 6365	VFFNP	47.720	5.5	25	4.36	2.625
24	Orsetti	BOS 52295	VFFNP	44.126	4.5	26	4.46	1.986
20	Harris Moran	HMX 3859	VFFNP	43.865	5.7	25	4.52	2.500
23	Orsetti	BOS 47721	VFFN	38.115	5.2	25	4.42	1.982
25	Orsetti	BOS 7025	VFFNP	35.153	5.7	23	4.46	2.004
22	Nippon Del Monte	NDM 0098	VFFN	34.521	4.9	24	4.52	1.692
19	Campbell's	CXD 236	VFFN	29.664	5.5	23	4.49	1.632
28	Sunseeds	SUN 6366	VFFNP	26.027	5.1	25	4.55	1.327
		Average		44.531	5.042	24.917	4.484	2.214

Yield results estimated from hand harvest of 10 ft.
SS = soluble solids
Color = lower values indicate redder fruit.
SS yield = soluble solids yield, in tons/A
Disease resistance: V = Verticillium, FF = Fusarium race 1 and 2, N = nematodes, P = bacterial speck.

Observation data from 1 plot only.

Table 3. Combined location means for yield, Brix, Brix yield, color, and pH for the replicated midseason maturity processing tomato varieties in 2004.

Variety	Yield (Tons/A)								Brix (%)		Brix Yield, Tons/A		Color		pH	
U 941	45.1	(01)	A						5.2	(12)	2.31	(01)	24.5	(09)	4.38	(12)
H 8892	43.2	(02)	A	B					5.2	(15)	2.18	(05)	24.5	(08)	4.36	(09)
H 5503	43.0	(03)	A	B					5.1	(17)	2.18	(06)	23.5	(04)	4.36	(08)
H 2401	42.9	(04)	A	B	C				5.2	(10)	2.20	(04)	24.8	(12)	4.27	(01)
H 9665	42.4	(05)	A	B	C	D			5.2	(16)	2.14	(09)	24.3	(07)	4.32	(05)
H 5803	40.9	(06)		B	C	D	E		5.7	(01)	2.30	(02)	23.8	(06)	4.32	(04)
Sun 6360	40.3	(07)		B	C	D	E		5.2	(11)	2.05	(11)	23.4	(03)	4.40	(16)
PS 296	40.1	(08)			C	D	E		5.7	(03)	2.28	(03)	25.7	(17)	4.27	(02)
H 2501	39.9	(09)				D	E		5.5	(05)	2.15	(08)	22.8	(01)	4.35	(07)
H 2601	39.6	(10)				D	E		5.2	(12)	2.03	(12)	25.2	(15)	4.39	(14)
Red Sky	39.2	(11)					E		5.4	(07)	2.08	(10)	23.8	(05)	4.42	(17)
UG 151	38.9	(12)					E		5.3	(09)	1.99	(13)	23.3	(02)	4.45	(18)
Halley 3155	38.7	(13)					E		5.7	(02)	2.17	(07)	24.8	(13)	4.33	(06)
CPL 4863-N	38.7	(14)					E		5.0	(18)	1.91	(16)	24.7	(10)	4.37	(10)
U 005	38.3	(15)					E		5.2	(14)	1.97	(15)	25.5	(16)	4.31	(03)
Sun 6119	38.1	(16)					E	F	5.4	(06)	1.98	(14)	27.1	(18)	4.38	(11)
La Rossa	35.4	(17)						F G	5.4	(08)	1.85	(18)	24.8	(11)	4.40	(15)
PX 607	34.0	(18)						G	5.6	(04)	1.87	(17)	25.2	(14)	4.38	(13)
MEAN	39.9								5.3		2.09		24.5		4.36	
LSD @ 0.05=	2.9								0.2		0.16		0.9		0.04	
C.V.=	12.7								6.1		13.4		6.1		1.6	
VARIETY X LOCATION LSD @ 0.05=	7.1								0.5		0.39		2.1		N.S.	

Brix is an estimate of soluble solids.

LSD 0.05 = least significant difference at the 95% probability level. Yields followed by the same letter are not significantly different.

CV = coefficient of variation.

Variety by location LSD = least significant difference for comparing means of the same variety at different locations. NS = not significant. For pH, this indicates that a variety maintained a certain pH regardless of location.

Numbers in parentheses ( ) indicate relative rank of a variety within the same column.

UCCE Fresh Market Tomato Variety Trial 2004, Merced County

UCCE Merced and Madera Counties

Location: Live Oak Farms. Field located behind shop, off Mariposa Way about 1/2 mile east of Plainsberg Rd. Honcut silt loam (HtA) grading to Wyman clay loam.
Cooperator: Bob Giampaoli

Varieties:

REPLICATED

1. BHN 580	BHN Seed
2. L-312	LSL Plant Science
3. Bobcat	Rogers/Syngenta
4. Miroma	" "
5. Quali T-21	" "
6. SVR 2935	Seminis
16. Catalyst	Rogers/Syngenta

OBSERVATION

7. BHN 654	BHN Seed
8. BHN 681	" "
9. BHN 682	" "
10. L-310	LSL Plant Science
11. L-311	" "
12. QualiT-23	Rogers/Syngenta
13. RFT 500 305	" "
14. RFT 500 311	" "
15. RFT 500 312	" "
17. Martian Giant	Seeds of Change
18. 3 Sisters	" "
19. Crimson Sprinter	" "

Plot Plan:

Rep 4	16	6	5	4	3	2	1	16	17	18
Rep 3	3	16	2	6	5	4	1	13	14	15
Rep 2	2	4	6	1	16	3	5	10	11	12
Rep 1	101	102	103	104	105	106	16	7	8	9
	REPLICATED							**OBS**		

Seeded: March 17, 19, and 24 at LaBar's greenhouse

Transplant: May 5, 2004. Used 10-34-0 + zinc humate in planter water. About 2500 gpa. Drip irrigated field. 40 plants per plot (about 50 ft). Field variety Quali T-23.
Field day: July 22, 2004
Harvest: July 23, 2004. Hand harvest 12 ft from each plot. Field sorted.

Results:

Yield and size results for the replicated trial is shown in Table 1. Fruit and vine characteristics are presented in Table 2. Yields were good in 2004, and the variation within each variety was similar, as shown in Figure 1. Because Miroma is a roma type tomato, it was hand sorted into only the S, M, and L categories. QualiT-21 had significantly better yields and %XL fruit than the other varieties. L-312 had significantly less marketable yield than all the other lines, mainly because it had a very high cull rate of almost 47%. L-312 fruit were misshapen, had zippers, and "measles", or small waxy spots on the skin. Both BHN 580 and SVR 2935 had nice fruit with good uniformity. There were no significant yield differences between the other varieties.

Observational results are listed in Tables 3 and 4. RFT 500 305 looked especially good in this trial, with best overall yields. Fruit were large and attractive, but did have a large blossom end. BHN 654 also looked very promising. All varieties from Seeds of Change were indeterminate and out of place in this trial. Vines were overly large and fruit load small.

Acknowledgements:

Thanks to Bob Giampaoli of Live Oak Farms, Daniel Acevedo of LaBar's Greenhouse, and the participating seed companies for their support for this project.

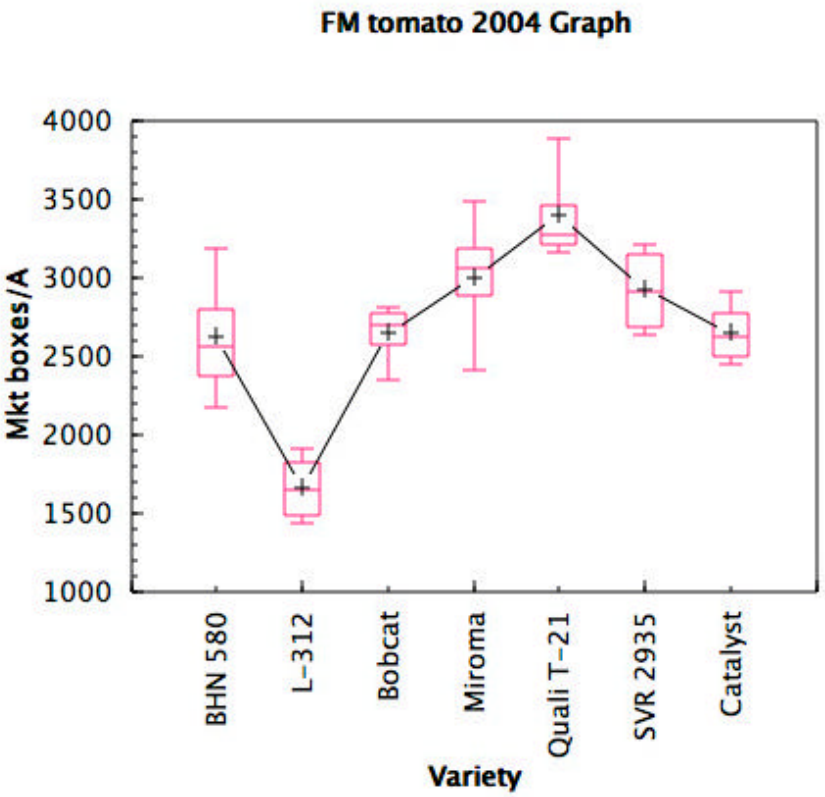

Figure 1. Total marketable yield (M, L, and XL fruit) for each replicated variety in the Merced fresh market tomato variety trial, 2004.

Table 1. Fresh market tomato variety trial yield and grade results, 2004.
Replicated varieties, Merced County.

Var #	Variety	Company	Market Yield Tons/A	Market Yield Boxes/A	XL % of marketable yield	L % of marketable yield	M % of marketable yield	S tons/A
5	Quali T-21	Syngenta	42.5	3398	52.6	36.9	10.5	3.9
4	Miroma	Syngenta	37.5	2999	0.0	39.6	60.4	7.1
6	SVR 2935	Seminis	36.4	2915	37.8	43.7	18.5	8.5
16	Catalyst	Syngenta	33.1	2646	39.2	41.2	19.6	5.5
3	Bobcat	Syngenta	33.0	2639	37.8	46.7	15.6	5.6
1	BHN 580	BHN Seed	32.7	2616	41.2	42.5	16.3	6.6
2	L-312	LSL Plant Science	20.7	1657	45.1	42.5	12.4	2.0
	Average			2695	42%	41.8	22%	5.6
	LSD 0.05			488	7.7	NS	5.4	1.7
	CV, %			12.2	12.1	11.2	16.5	20.5

Market yield = XL + L + M size fruit, average of four replications. One box = 25 lbs.
XL, L, M% = weight of respective fruit sizes divided by marketable yield. Miroma not classed as XL.
Red% = weight of all red fruit divided by total yield. Indicates relative maturity among tested varieties.
Culls, %: Any fruit so disfigured (due to rot, cat facing, insect damage, etc.) as to be unmarketable.

XL = 3 inches and larger in diameter
L = 2.5 to 3"
M = 2.25 to 2.5"
S = 2 to 2.25" Fruit smaller than 2" were not harvested.

LSD 0.05 = least significant difference at the 95% probablility level.
Yields followed by the same letter are not significantly different.
NS = not significant at the 95% probability level.
CV = coefficient of variation, a measure of the variability in the experiment.

Table 2. Fresh market tomato fruit and vine characteristics. Merced County, 2004.
REPLICATED varieties.

Var #	Variety	Vine Size	Leaf cover	Leaf roll	Fruit shape	Rough-ness	Blossom end	Sun-burn	Cat-facing	Zip-pers	Maturity	disease resista
1	BHN 580	L	G	N	G	S	T	N	N	N	0	VFFN
2	L-312	M	OK	S	FG	S	T	SL	N	N	+	VFFTN
3	Bobcat	ML	G	S	DG	M	T	N	N	N	0	
4	Miroma	M	G	SL	ROMA	S	T	SL	N	N	-	
5	Quali T-21	L	G	N	DG	M	SL	N	N	N	0	
6	SVR 2935	ML	G	N	G	S	SL	N	N	SL	0	VFFNA
16	Catalyst	ML	G	N	G	M	T	N	N	SL	0	

Vine Size:	M = medium	ML = medium large	L = large	VL = ve
Leaf Cover:	P = poor	OK = adequate	G = good	
Leaf Roll:	N = none	SL = slight	S = some	
Fruit Shape:	DG = deep globe	G = globe	FG = flat globe	
Shoulder roughness:	S = smooth	M = medium	MR = medium rough	R = rou
Blossom End:	T = tight	SL = slight scar	M = medium size scar	
Cat Facing:	N = none	SL = slight	S = some	
Maturity:	- = earlier than T-21	0 = same as T-21	+ = later than T-21	
Sunburn:	N = none	SL = slight	S = some	
Zippers:	N = none	SL = slight	S = some	
Disease:	disease resistance provided by company			
	V = verticillium wilt			
	FF = Fusarium wilt race 1 and 2			
	N = nematodes			
	T = tobacco mosaic virus			
	Asc = Alternaria stem canker, St = Stemphyllian, Sw = Spotted Wilt, Ty = tomato yellow leaf c			

Table 3. Fresh market tomato variety trial yield and grade results, 2003.
Observational varieties, Merced County.

			Market Yield		XL	L	M	S
Var #	Variety	Company	Tons/A	Boxes/A	% of marketable yield			tons/A
13	RFT 500 305	Syngenta	38.5	3079.7	45.8	40.5	13.7	7.6
15	RFT 500 312	Syngenta	38.1	3046.3	38.1	51.1	10.8	4.3
7	BHN 654	BHN Seed	37.2	2976.6	43.1	44.8	12.0	3.9
9	BHN 682	BHN Seed	33.7	2697.8	50.0	32.9	17.1	3.4
14	RFT 500 311	Syngenta	33.0	2642.6	36.4	49.0	14.6	5.8
12	Quali T-23	Syngenta	29.3	2346.4	53.7	35.5	10.8	4.7
10	L-310	LSL Plant Science	27.0	2160.6	45.4	38.8	15.8	3.6
11	L-311	LSL Plant Science	27.0	2160.6	45.9	42.5	11.6	2.1
8	BHN 681	BHN Seed	21.6	1727.9	36.8	43.4	19.7	3.4
19	Crimson Sprinter	Seeds of Change	15.2	1212.4	3.6	50.3	46.1	12.7
17	Martian Giant	Seeds of Change	4.5	357.2	78.0	22.0	0.0	0.0
18	3 sisters	Seeds of Change	1.5	119.1	0.0	0.0	100.0	10.9
	Average		**25.5**	**2043.9**	**39.7**	**37.6**	**22.7**	**5.2**

Market yield = XL + L + M size fruit, from one plot. One box = 25 lbs.
XL, L, M% = weight of respective fruit sizes divided by marketable yield.
Red% = weight of all red fruit divided by total yield. Indicates relative maturity among tested varieti
Culls, %: Any fruit so disfigured (due to rot, cat facing, insect damage, etc.) as to be unmarketable.

XL = 3 inches and larger in diameter
L = 2.5 to 3"
M = 2.25 to 2.5"
S = 2 to 2.25" Fruit smaller than 2" were not harvested.

ıarket tomato fruit and vine characteristics. Merced County, 2004.
ıL varieties

	Vine Size	Leaf cover	Leaf roll	Fruit shape	Rough-ness	Blossom end	Sun-burn	Cat-facing	Zip-pers	Maturity	disease resistance	Comments
	ML	G	N	DG	S	T	SL	N	N	0	VFFT	good
	ML	OK	N	G	M	SL	SL	N	S	-	VFF	rough fruit, zippers
	L	G	N	DG	S	T	N	N	SL	0	VFF	
	ML	G	SL	G	M	T	SL	SL	SL	0	VFFN	rough fruit
	M	OK	S	G/FG	M	T	SL	N	SL	-	VFFTN	leaf curl
	ML	G	SL	DG	S	SL	N	SL	SL	-		
05	L	G	N	DG	MR	M	N	N	N	0		good size, lg blossom sc
11	M	G	SL	G	S	T	N	N	N	0		
12	L	G	SL	G	M	SL	N	N	SL	+		
ant	VL	OK	N	FG	R	M	N	lots	S	mixed		indeterminant, heirloom
	VL	G	N	G	S	T	N	S	S	mixed		indeterminant, heirloom
printer	VL	G	N	FG	M	SL	N	S	S	mixed		indeterminant, heirloom

M = medium ML = medium large L = large VL = very large
P = poor OK = adequate G = good
N = none SL = slight S = some
DG = deep globe G = globe FG = flat globe
ness: S = smooth M = medium MR = medium rough R = rough
T = tight SL = slight scar M = medium size scar
N = none SL = slight S = some
- = earlier than T-21 0 = same as T-21 + = later than T-21
N = none SL = slight S = some
N = none SL = slight S = some
disease resistance provided by company
V = verticillium wilt
FF = Fusarium wilt race 1 and 2
N = nematodes
T = tobacco mosaic virus

Fresh Market Tomato Variety Trials: Postharvest Evaluations for 2004

Marita Cantwell, Michelle Le Strange, Jan Mickler, Robert Mullen

In 2004, we evaluated 7 and 8 **round** fresh market tomato varieties from the replicated trials in Fresno and San Joaquin Counties, respectively, for color, firmness and composition at the table-ripe stage. Fruit were harvested as mature-greens (MG) and vine-ripes (VR, 30-40% color). We also evaluated an additional 13 varieties (harvested MG) from the observational trial in Fresno County (data not shown). **Roma** fresh market tomato varieties were harvested from both the Fresno (4 varieties) and San Joaquin County (6 varieties) trials at the MG and VR stages.

The quality measurements carried out on fruit at the table-ripe stage are described in **Table 1.** Fruit were sorted and washed with chlorinated water. A minimum of 45 fruit (3 reps of 15 each) were ripened under standard conditions: 3-4 days 100 ppm ethylene at 20°C (68°F) and high relative humidity followed by placement on trays (overwrapped with food wrap to reduce but not eliminate water loss) to complete ripening at 20°C. Fruit that did not show color change within 3-4 days of ethylene treatment were discarded. VR fruit were placed on trays to complete ripening at 20°C (68°F). Fruit were evaluated when they reached the **table-ripe stage** (color stage 6 on USDA scale + 1-2 days).

A summary of the results for **round** tomato varieties are presented in **Table 2.** The 2004 round variety fruit generally had lower soluble solids (4.2% average for all varieties and both trials) than 2003 fruit (4.9% average), whereas % titratable acidity values were in the usual range of 0.3-0.4%. VR harvested fruit generally have the same % soluble solids but higher % titratable acidity than MG harvested fruit. Fruit in 2004 were firmer on average than fruit evaluated in 2003. Shady Lady was consistently low in firmness but had good color development, whereas L-311 or L-312 fruit were consistently firmer but had poorer red color development. **Roma** tomato variety results are summarized in **Table 3**. The soluble solids averaged slightly less than 4.2% for 2004 Roma fruit, whereas the average for fruit evaluated in 2003 was 5.4%. The % titratable acidity was also lower in 2004 than 2003 for the Roma varieties. Red color and firmness were generally good for all varieties evaluated, although VR harvested fruit were not as firm as the ripened MG fruit.

Table 1. Ripe tomato quality measurements for 2004 variety trials.

Attribute	Measurement	Additional Information
1. Color	Objective color values using a Minolta Color meter	Data reported as Hue; this is the most useful single value to compare tomato color. Hue values from 35-40 indicate very good red color.
2. Texture	Compression test: the force to compress the fruit a distance of 5 mm	Computerized texture analyzer equipped with a 25 mm flat cylinder moving at 0.5 mm/sec. Very firm, firm, moderately firm, moderately soft, soft and very soft fruit correspond to >25, 18-15, 15-18, 12-15, 8-12 and <8 Newtons force, respectively. 1 N =9.81 kg-force or 4.45 lb.-force.
3. Composition	3a. Soluble solids (SS) are measured on a refractometer	Fruit are quartered, blended. The juice is filtered and used. 5 min per fruit for sample preparation and measurements of SS and TA. Values can range from 3.5-7.0%.
	3b. Titratable acidity (TA); 10 mL juice are titrated with NaOH	pH of the juice is taken as a part of these measurements. Generally there is an inverse relationship between pH and T.A. Values can range from 0.2-0.6%.

Table 1. Quality characteristics of fresh market **round** tomatoes harvested **MG** and **VR** from the 2004 Kings County and San Joaquin County replicated trials. MG fruit were treated with ethylene. Fruit were ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. F=Fresno County Trial; SJ=San Joaquin County Trial.

Cultivar & Company	Number of trials	Red Color, Hue	Firmness, Newtons	Soluble solids, %	pH	Titratable acidity, %
MG Harvested Fruit						
BHN 580 (BHN)	2	40.5	22.2	4.28	4.82	0.32
Bobcat (Syngenta)	2	39.8	22.1	4.20	4.32	0.31
Catalyst	1 SJ	40.9	26.0	4.21	4.70	0.38
L-311 (LSL Pl Sci.)	1 F	46.3	28.7	4.22	4.57	0.30
L-312 (LSL Pl Sci.)	1 SJ	41.2	20.6	4.22	4.53	0.28
QualiT 21 (Syngenta)	2	41.0	23.7	4.23	4.78	0.30
QualiT 23 (Syngenta)	2	39.8	22.2	4.16	4.45	0.32
Shady Lady (Sunseeds)	2	39.2	19.1	4.20	4.53	0.32
SVR2935 (Seminis)	2	40.6	25.4	4.32	4.64	0.26
Average	**MG**	**41.1**	**23.3**	**4.23**	**4.59**	**0.31**
VR Harvested Fruit						
BHN 580 (BHN)	2	43.2	22.1	4.22	4.80	0.38
Bobcat (Syngenta)	2	43.4	21.2	4.17	3.93	0.30
L-311(LSL Pl Sci.)	1 F	45.8	23.1	4.18	4.18	0.35
Catalyst	1 SJ	42.7	23.7	4.22	4.43	0.35
QualiT 21 (Syngenta)	1 F	44.4	17.9	4.15	4.20	0.32
QualiT 23 (Syngenta)	2	43.6	19.8	4.14	4.53	0.38
Shady Lady (Sunseeds)	2	42.6	18.4	4.19	4.45	0.36
SVR2935 (Seminis)	2	42.7	22.4	4.24	4.68	0.35
Average	**VR**	**43.6**	**21.1**	**4.19**	**4.40**	**0.35**
"LSD.05"		1.0	2.1	0.06	0.35	0.04

Color and firmness data are from 3 replicates of 15 fruits; composition data are from 3 replicates of composite samples of 15 fruit. Data were analyzed as 2-way ANOVA for each trial. The "LSD.05" value provides an estimate and is from the average LSD.05 values for the 2 maturity stages for the 2 trials. Lower hue color values indicate redder fruits, lower firmness values indicate softer fruits.

Table 2. Quality characteristics of fresh market **Roma** tomatoes harvested **MG** and **VR** from the 2004 San Joaquin County replicated trial and ripened at 20°C (68°F). Fruit were evaluated at the table-ripe stage as determined visually. See Tables 1-3 for explanation of measurements. Varieties are listed in alphabetically. F=Fresno County Trial; SJ=San Joaquin County Trial.

Cultivar & Company	Number of trials	Red Color, Hue	Firmness, Newtons	Soluble solids, %	pH	Titratable acidity, %
MG Harvested Fruit						
BHN 523 (BHN)	2	38.6	26.6	4.13	4.80	0.35
Mariana (Sakata)	1 SJ	40.5	29.0	4.24	5.20	0.35
Miroma (Syngenta)	2	39.5	22.9	4.18	4.44	0.33
Monica (Sakata)	1 SJ	38.8	27.8	4.21	5.50	0.38
PX 2626 (Seminis)	1 F	38.7	25.0	4.19	4.53	0.29
RFT 8109 (Syngenta)	1 SJ	39.3	25.3	4.20	5.37	0.36
SD 257 (LSL Pl Sci)	2	37.8	26.1	4.18	4.70	0.34
Average MG		**39.0**	**26.1**	**4.19**	**4.93**	**0.34**
VR Harvested Fruit						
BHN 523 (BHN)	2	42.0	21.6	4.06	4.88	0.42
Mariana (Sakata)	1 SJ	40.3	23.3	4.25	5.47	0.41
Miroma (Syngenta)	2	42.6	19.3	4.20	4.80	0.36
Monica (Sakata)	1 SJ	39.3	18.7	4.26	5.67	0.42
PX 2626 (Seminis)	1 F	42.6	21.2	4.17	4.43	0.31
RFT 8109 (Syngenta)	1 SJ	41.1	19.7	4.20	5.40	0.38
SD 257 (LSL Pl Sci)	2	41.6	21.2	4.20	4.86	0.37
Average	**VR**	**41.3**	**20.7**	**4.19**	**5.07**	**0.38**
"LSD.05"		0.6	2.4	0.09	0.19	0.03

Color and firmness data are from 3 replicates of 10-15 fruits; composition data are from 3 replicates of composite samples of 10-15 fruit. Data were analyzed as 2-way ANOVA for each trial. The "LSD.05" value provides an estimate and is from the average LSD.05 values for the maturity stages for the 2 trials. Lower hue color values indicate redder fruits, lower firmness values indicate softer fruits.

CTRI Project Summary Report, 2004

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TITLE: Evaluation of variety tolerance to herbicide control of yellow nutsedge and nightshade in a processing tomato/cotton production system in salty soil.

Summary. Certain processing tomato varieties were found to be sensitive to the new nutsedge herbicide Sandea (halosulfuraon-methyl), and phytotoxicity was exasperated when Matrix (rimsulfuron, for nightshade control) was added to the tank-mix. SUN 6119 and H9780 had more than 50% phytotoxicity one week after spraying, however, there was no significant effect on yield. No significant phytotoxicity was seen with the other herbicide treatments. Results from 2003 show that the Sandea + Matrix combination gives excellent weed control in fields with nutsedge and nightshade weed problems. It is important for growers to know that while Sandea may cause some yellowing of the plants, this effect is temporary and will not impact yield.

RESULTS AND DISCUSSION: This trial was established in a field near Los Banos, CA, to evaluate current nightshade and nutsedge herbicides on weed efficacy and crop performance in different varieties. Five processing tomato varieties and six herbicide treatments were used in this trial. The herbicide treatments consisted of:

1. Dual Magnum (metolachlor) PPI – grower applied at label rate (UTC)
2. Dual + Sandea (halosulfuron-methyl) 1 oz/A + NIS
3. Dual + Matrix (rimsulfuron) 2 oz/A + NIS
4. Dual + Sencor (metribuzin) 2/3 lb broadcast
5. Dual + Sandea 1 oz/A + Matrix 2 oz/A + NIS
6. Dual + Matrix 2 oz/A + NIS + Sencor 2/3 lb broadcast

The varieties used were:

1. Halley 3155
2. H9665
3. PS 296
4. SUN 6119
5. H9780

A split-plot design was used, with herbicide as the main treatment and variety the split plot treatment. Plot was located within a commercial production field, furrow irrigated. The field had already received an pre-plant incorporated (PPI) application of Dual Magnum. Varieties were transplanted May 8, 2004. Herbicide applications were broadcast applied June 16, 2004 over-the-top when plants were at full bloom. Treatments were slightly delayed because I was waiting to see if irrigation would bring a flush of weeds, which did not occur. Post application phytotoxicity ratings were based on yellowing, stunting, and leaf necrosis using a scale of 0 to 10. Values were transformed using the arcsin transformation for statistical analysis. For phytotoxicity ratings, the control plots were arbitrarily assigned a value of zero and used as a

comparison to the other treatments within a block. As such, UTC treatments were not included in the statistical analysis (phytotoxicity ratings only).

Soil was a Dos Palos clay loam, moderately saline with an EC of 1.7 in the upper 12 inches. Soil analysis results are shown in Table 1.

Phytotoxicity ratings are shown in Table 2. Averaged across varieties, the Sandea + Matrix tank mix caused significantly greater phytoxocity, almost 35% one week after application, as compared to the other treatments. The next most phytotoxic treatment was the Matrix + Sencor tank mix, at 8% (Figure 1).

A strong variety by herbicide interaction (significant at $p < 0.001$) indicated that the amount of phytotoxicity caused by the herbicide treatments was different between the varieties. SUN 6119 and H 9780 were both far more sensitive to Sandea and Sandea + Matrix than the other varieties (Figure 2). The Sandea + Matrix tank-mix resulted in far greater phytotoxicity than either chemical alone. SUN6119 had greater than 60% phytotoxicity one week post application.

By two weeks after herbicide application, almost no phytotoxicity symptoms could be seen.

Weed control ratings were very limited until the end of the season. The grower had preplant applied Dual Magnum to the whole field. Additionally, the field had been in Roundup Ready cotton the previous year, which had eliminated much of the nightshade and nutsedge pressure. As a result, there was no nightshade or nutsedge growing in any of the plots. By the end of the season, however, mallow, pigweed, and Johnson grass were present. The herbicide treatments did significantly reduce the amount of weed pressure as compared to the UTC (Figure 3).

Variety had a significant effect on yield, soluble solids, color, and pH, but there was no significant difference from herbicide treatments (Table 2). The Sandea + Matrix treatment yielded as well as the UTC in spite of the phytotoxicity symptoms earlier in the season (Figure 4).

This trial was shown at a field day on August 19, which was poorly attended, and results were presented at the IPM Update Class in Merced on October 12. Last January, results from the 2003 trial were shown and the Northern San Joaquin Processing Tomato Production meeting in Modesto.

Acknowledgements: Many thanks to CTRI for their financial assistance and Dan Burns, San Juan Ranch, for his cooperation with this trial.

Table 1. Soil analysis results.

Depth inches	*NO_3-N ppm*	*OlsenP ppm*	*X-K ppm*	*pH*	*EC dS/m*	*Ca meq/L*	*Mg meq/L*	*Na meq/L*	*Cl meq/L*
0 – 12	24.1	13.6	195	7.4	1.70	6.9	3.7	7.6	3.6
12 – 24	11.5	3.3	138	7.5	1.60	4.8	3.1	8.4	4.8

Table 2. Crop phytotoxicity and weed control ratings as affected by herbicide treatment, Merced 2004.

Treatment	Variety	week post		2 weeks post		19-Aug	yield				
		Phyto, %	Weeds	Phyto, %	Weeds	Weeds	lbs/5 ft	tons/A	Color	SS, %	pH
1. UTC		0	0	0	7.3	40.9					
2. Sandea		6.27		0	0.1	14.7					
3. Matrix		3.40		0.4	0	5.3	67.00	58.37	25.8	5.07	4.39
4. Sencor		0.38		0	0	3.7					
5. Sandea + Matrix		34.76		3.4	0	8.8					
6. Matrix + Sencor		8.00		0	0	5.9					
	3155	7.5	0	0.1	---	---	63.76	55.55	25.8	5.28	4.39
	H9665	5.7		0.1	---	---	78.83	68.68	24.8	4.57	4.34
	PS 296	7.6		0.1	---	---	59.18	51.56	25.3	5.60	4.35
	SUN 6119	18.2		2.0	---	---	71.93	62.67	26.8	5.07	4.46
	H9780	13.8		1.4	---	---	66.32	57.78	26.3	4.82	4.42
Herb treatment LSD		5.94	---	1.5	1.5	5.8	NS		NS	NS	NS
Variety LSD		3.5	---	1.3	---	---	5.40	4.70	1.12	0.21	0.06
Treatment x Variety		***	---	**	---	---	NS		---	----	---
CV, %		52.6	---	269.0	194.0	70.0	14.0		3.6	3.5	1.05

Herbicide application made June 16.
Phytotoxicity values as compared to the untreated control.
Weeds primarily mallow and pigweed. Values indicate weed pressure (0 = nothing). Ratings only made on herbicide treatments.

LSD = Least significant difference at the 95% probability level. Means separated by less than this amount are not significantly different.
NS = not significant
***, ** = interaction significant at p=0.001 and 0.01 respectively.

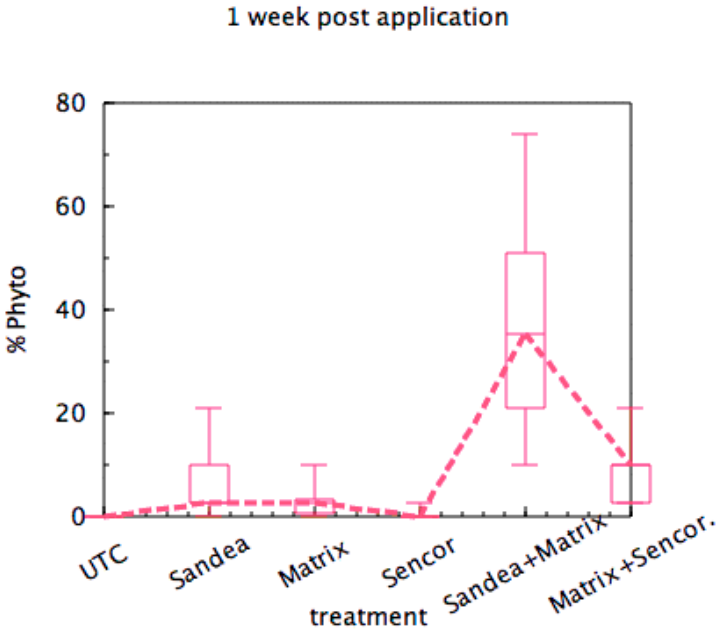

Figure 1. Box-plot showing phytotoxicity caused by herbicide treatments at one week after application.

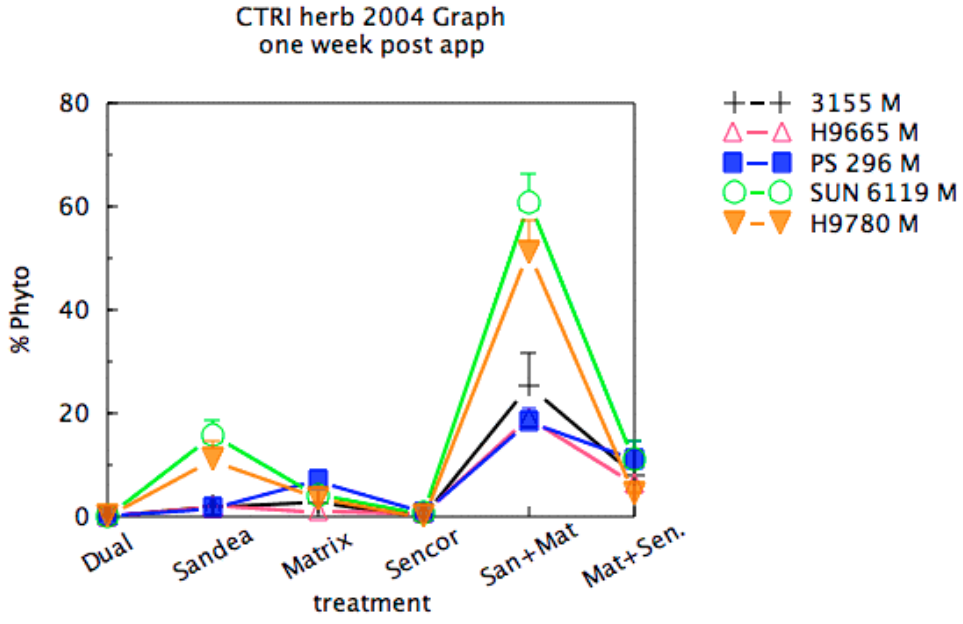

Figure 2. Phytotoxicity showing the variety by herbicide treatment interaction one week after application. SUN 6119 and H9780 were more sensitive to the herbicides than the others.

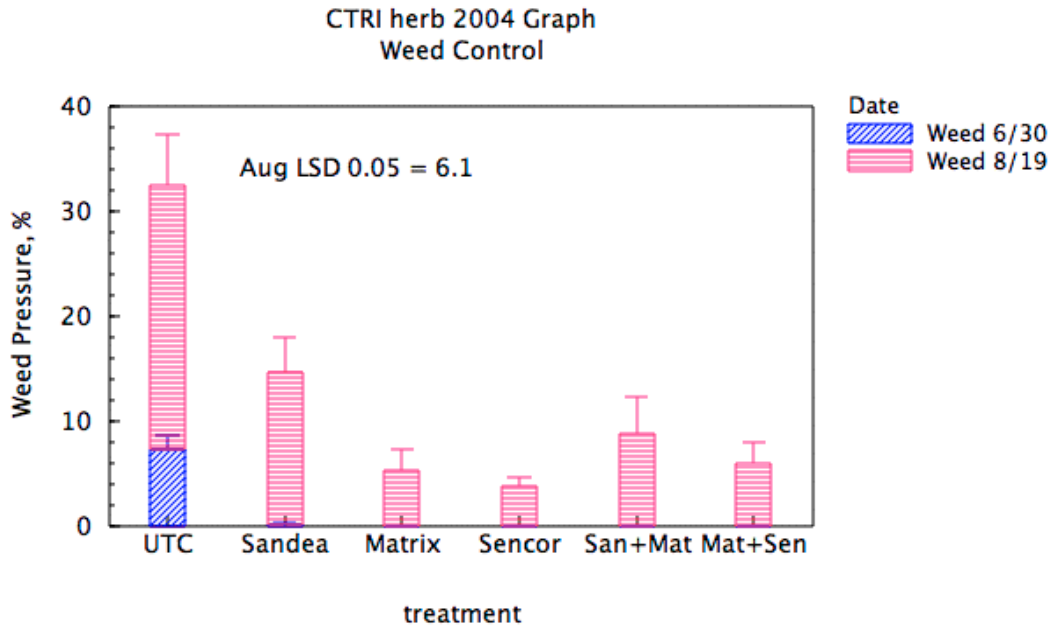

Figure 3. Weed control as affected by herbicide treatment. At 2 weeks post application there were very few weeds in any of the plots. Towards the end of the season, weed control was significantly better in all herbicide treatments as compared to the UTC plot.

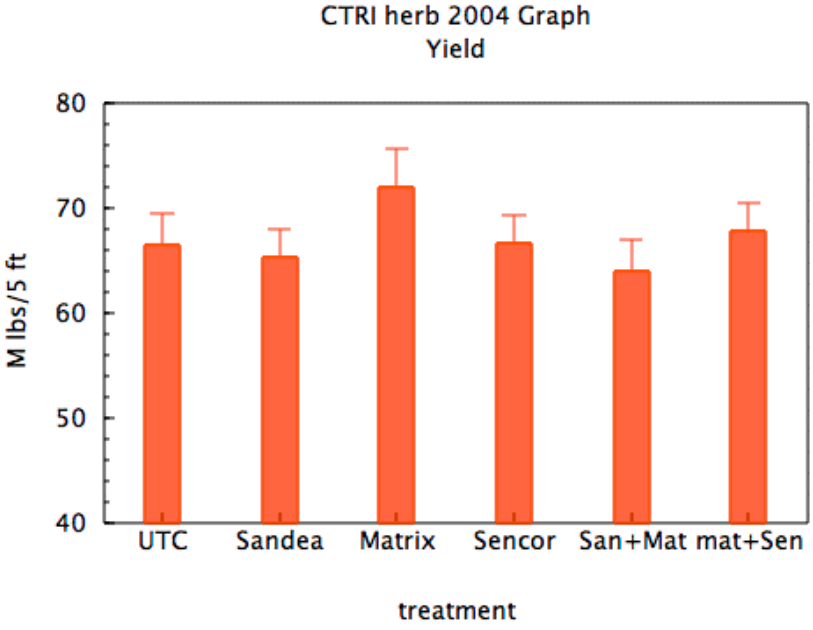

Figure 4. Average yield as affected by herbicide treatment. While there was a large variety effect, there was no significant difference in yield with the herbicide treatments.

Sandea Herbicide Variety Evaluation On Processing Tomatoes.
Merced County, 2004

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OBJECTIVE: Evaluate different commercial processing tomato varieties in their tolerance to different rates of Sandea (halosulfuron-methyl) herbicide. A tank mix with Matrix (rimsulfuron) was also included for evaluation.

METHODS: A split plot, randomized block treatment design was utilized in a production tomato field located north of Dos Palos in Merced County. Eighteen different commercially available varieties were direct seeded April 23 (Table 1). Main plot size was 100 feet by one bed (5 feet wide), replicated 4 times. Plots were hand seeded using a Planter Jr into prepared beds. Dual Magnum had already been preplant incorporated for weed control. 80% emergence occurred by May 10.

On May 25, herbicide treatments were applied with a hand held CO_2 sprayer using 8002 nozzles at 35 psi and 30 gpa equivalent. A not-ionic surfactant (R11) was used with all treatments. Herbicides were broadcast applied over the top of the tomatoes, most of which were about 4 true leaves. Herbicide plots split the varieties, and were 25 feet long. Some pigweed was present in the plots at the time of application, but little to no nightshade nor nutsedge. Herbicide treatments are listed in Table 1. The recommended label rate for Sandea on tomatoes is 1 oz per acre, and for Matrix it is 2 oz/A.

Phytotoxicity evaluations began one week after herbicide application, on June 2, 2004. Plots were evaluated for a total of three weeks. Sprayed plots were compared to the untreated and given a rating from 0 to 5, where 0 = no phytotoxicity and 5 = complete death. Phytotoxicity symptoms included yellowing, twisting/distortion of leaves, necrotic spots, and stunting (complete death from the herbicide treatments was not observed in this trial).

Treatment effects on yield were estimated by hand harvesting 5 feet within each plot. Due to loss of plants/plots from cultivator damage, not all plots were harvested. Plots were harvested September 10.

At about the time of the first evaluation, the plots suffered mechanical damage from machine discing to control weeds. Some plots were completely lost. As a result, only 3 of the 4 reps could be used in the statistical analysis.

Treatment effects were analyzed using CoStat 6.3, using standard split-plot AOV procedures. The evaluation data were transformed using the arcsin transformation to improve the homogeneity of the variances. The transformed data result in phytotoxicity scores that are expressed as percentages of the untreated control. Because the check plots were used as a comparison to the other treatments that received herbicides, they were arbitrarily assigned a value of zero and therefore were not included in the statistical analysis.

RESULTS: Phytotoxicity scores are presented in Table 1 and Figures 1 – 4. Significant differences were found between the varieties regarding their sensitivity to Sandea, but there was no significant difference

between the treatments that received Sandea. Averaged across all varieties, Sandea at 1 oz per acre was no more phytotoxic than the 0.67 oz rate. Surprisingly, the addition of Matrix did not significantly increase phytotoxicity either as compared to Sandea alone (Figure 2). In a similar trial at a different location, the addition of Matrix to Sandea caused significantly more plant injury.

The varieties appear to break out into 2 groups: almost no observed phytotoxicity from the treatments, and those which showed levels > 25% at two weeks post-application. The varieties in the "sensitive" group were SUN 6119, H9780, H9557, HM830, SUN 6117, and HYPEEL 108. 3155, UG 113, and Hypeel 303 showed moderate sensitivity around 20% two weeks post application (Figure 1). All other varieties would be considered not sensitive or tolerant of Sandea.

Only at the first evaluation was the variety x herbicide interaction significant (Fig 3). The lack of a significant interaction indicates that each variety responded similarly to the herbicide treatments. For example, H9665 had very little phytotoxicity even as Sandea rate increased or Matrix was added. H9780 was much more sensitive to Sandea, but again the phytotoxicity was about the same for all treatments (Fig 4). Figure 6 shows the leaf symptoms of sensitive variety HyPeel 108.

Despite the wide difference in phytotoxicity, there were no significant yield differences observed between the herbicide treatments (Table 1). Significant differences were observed between varieties (Fig 5). Best yields occurred with H9665, followed closely by H9780, HyPeel 347, BOS S55, and H9557.

ACKNOWLEDGEMENTS: Many thanks to John Woodruff with Wolfson's Ranch for his help and cooperation with this test, James Brazzle with Gowen Co. for product, and the following seed company reps for variety seed donations: Matt Leinfelder, Heinz; Roland Zeidler, Unilever; Jerry Tarry and Greg Orsetti, Orsetti; Justin Bream, United Genetics, Erik Kowes, Harris Moran; Steve Schroeder, Sunseeds; Hasaan Bolkan, Campbell's; John Bill, Petoseed.

Table 1. Sandea variety evaluation on processing tomatoes. Merced 2004.

Herbicide treatment	Variety	Phytotoxicity Rating, % 2-Jun-04	8-Jun	15-Jun	yield lbs/5 ft	tons/A
1. UTC		13.3	0.0	0.0	48.9	
2. Sandea 0.66 oz/A		48.2	30.1	24.4	50.1	43.2
3. Sandea 1.0 oz/A		42.9	25.4	18.3	49.3	
4. Sandea 0.66 oz + Matrix 2 oz/A		50.1	24.8	20.1	49.9	
	1 Halley 3155	44.4	22.2	25.0	46.0	40.08
	2 BOS S55	29.7	6.6	11.8	53.3	46.43
	3 H9494	29.7	0.0	3.3	52.2	45.48
	4 H9665	26.4	2.2	0.9	58.8	51.23
	5 H8892	36.6	8.8	1.8	37.7	32.84
	6 SUN 6119	60.3	36.6	47.1	50.7	44.17
	7 H9780	63.3	44.0	43.2	55.5	48.35
	8 H1100	28.4	15.3	29.5	40.6	35.37
	9 H9557	43.2	25.8	47.1	52.8	46.00
	10 UG 113	21.5	18.8	24.0	50.6	44.08
	11 HM 830	51.8	28.5	13.8	48.6	42.34
	12 SUN 6117	58.9	34.4	33.3	56.6	49.31
	13 CXD 179	21.9	6.6	3.3	45.6	39.73
	14 U447	25.0	8.1	9.1	50.8	44.26
	15 APT 410	39.6	10.8	3.0	44.5	38.77
	16 Hypeel 347	28.9	7.5	7.5	54.6	47.57
	17 Hypeel 108	59.4	64.1	70.0	52.2	45.48
	18 Hypeel 303	28.4	23.1	3.3	50.7	44.17
Herbicide LSD 0.05		6.75	NS	NS	NS	
Variety LSD 0.05		23.24	22.9	21.6	8.8	
Variety x herbicide		*	NS	NS	NS	
CV, %		49.6	66.5	76.8	19.0	

Phytotoxicity ratings on a scale of 0 - 5. Ratings converted to % using arcsin method.
Yield measured by hand picking 5 ft within each plot.

LSD 0.05 = Least Significant Difference at the 95% confidence level. Means less than this amount are not significantly different. NS = not significant. UTC means for phytotoxicity ratings are not included in the statistical analysis.
* = interaction significant at p=0.1.
CV = coefficient of variation.

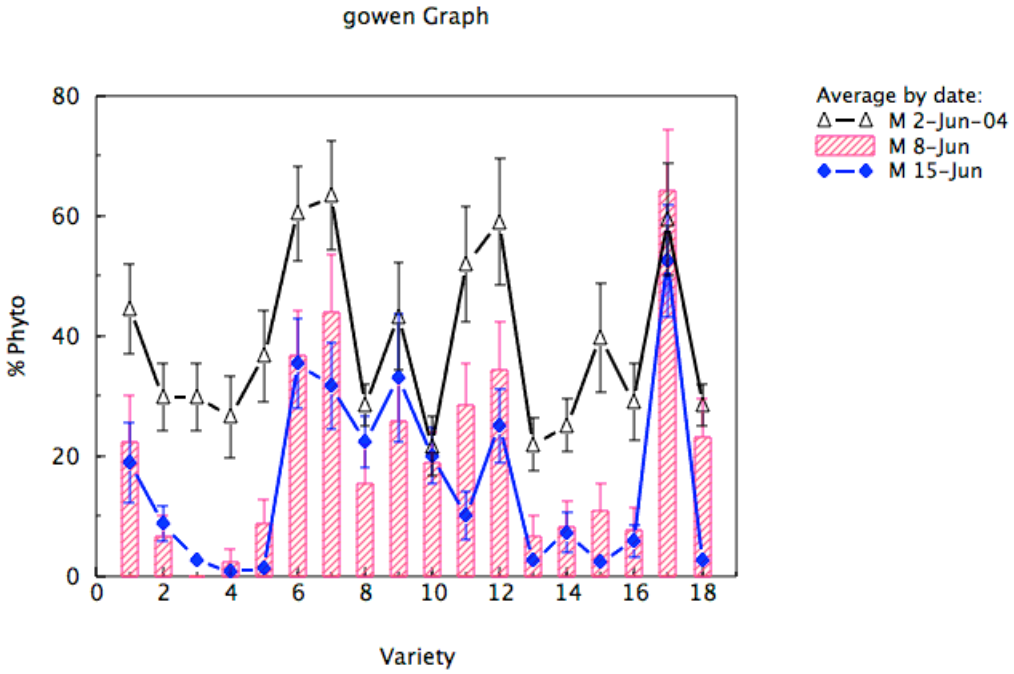

Figure 1. Tomato phytotoxicity by variety at three post application dates. Error bars are +- one standard error.

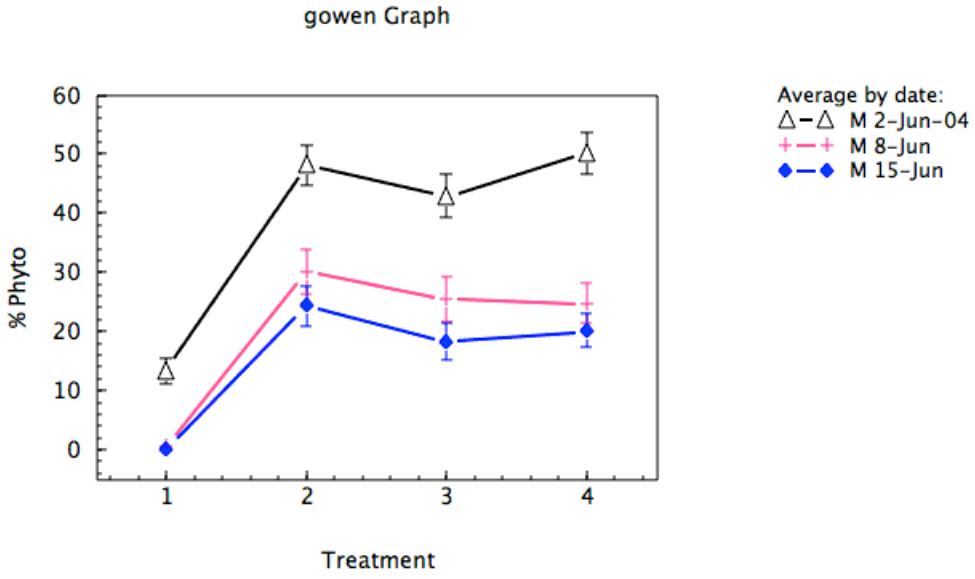

Figure 2. Tomato phytotoxicity rating for each treatment at three post application evaluation dates. Error bars are +- one standard error.

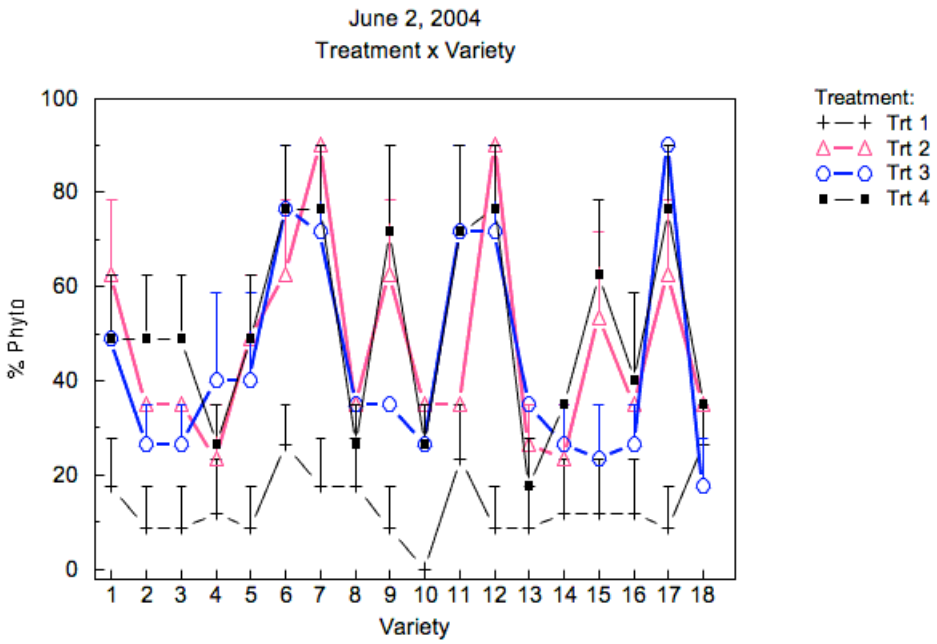

Figure 3. Variety by treatment interaction for observed phytotoxicity on processing tomatoes on June 2 (1 week post-treatment). Error bars are one standard error.

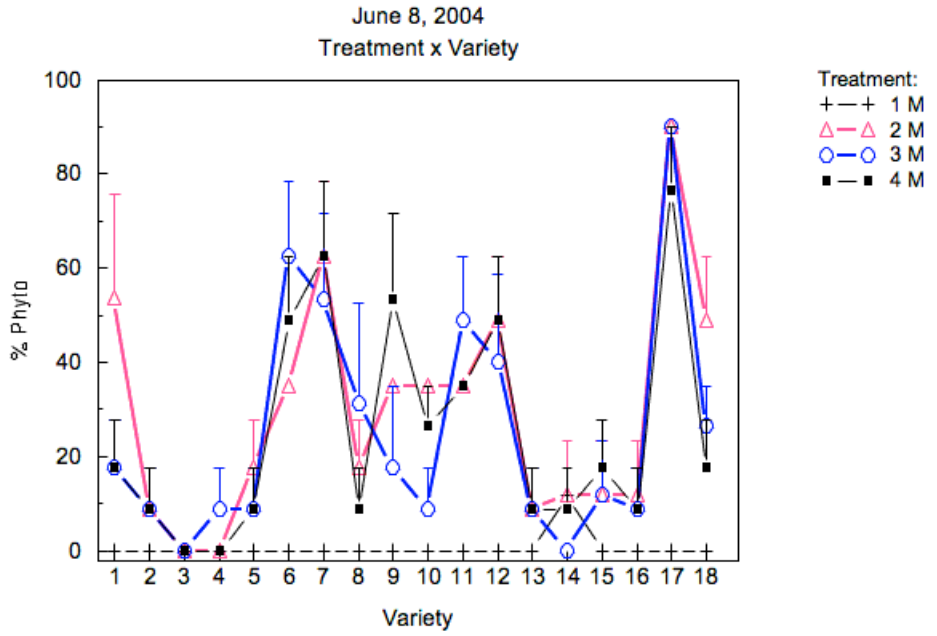

Figure 4. Variety by treatment interaction for observed phytotoxicity on processing tomatoes on June 8 (2 weeks post-treatment). Error bars are one standard error. Excluding the UTC, this interaction was not significant on this date.

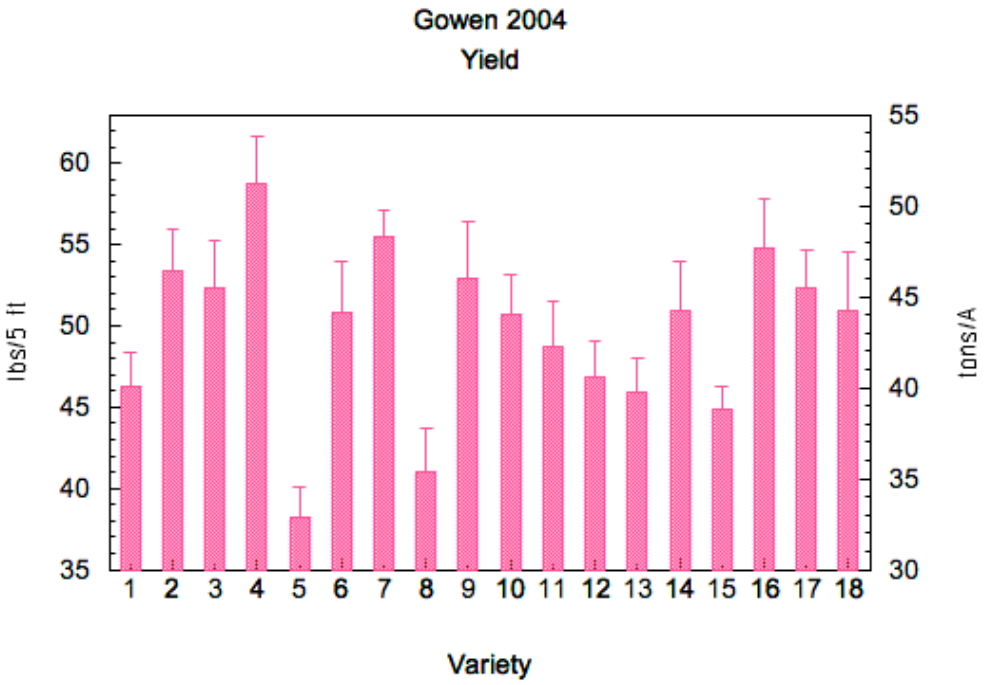

Figure 5. Yield by variety, averaged across herbicide treatments. Error bars are +1 standard error. Significant differences were found between varieties, but not herbicide treatments.

Figure 6. Photos of effects of Sandea on sensitive variety HyPeel 108.